# CLAIMS

What is claimed is:

1. A method of optimizing production in a well, comprising:

operating an artificial lift system in a wellbore;

monitoring a plurality of production parameters at the surface;

monitoring a plurality of downhole parameters in the wellbore;

evaluating measured data derived from the plurality of production parameters and the plurality of downhole parameters according to an optimization model; and

adjusting operation of the artificial lift mechanism based on the automatic evaluation.

2. The method as recited in claim 1, wherein operating comprises operating an electric submersible pumping system.

3. The method as recited in claim 1, wherein monitoring the plurality of production parameters comprises measuring a tubing pressure and a tubing temperature.

4. The method recited in claim 1, wherein monitoring the plurality of production parameters comprises measuring a casing pressure.

5. The method as recited in claim 1, wherein monitoring the plurality of production parameters comprises measuring multiphase flow data.

6. The method as recited in claim 1, wherein monitoring the plurality of production parameters comprises measuring a tubing pressure, a tubing temperature, a casing pressure, and multiphase flow data.

7. The method as recited in claim 1, wherein monitoring the plurality of downhole parameters comprises measuring a pump intake pressure.

8. The method as recited in claim 1, wherein monitoring the plurality of downhole parameters comprises measuring a pump discharge pressure.

9. The method as recited in claim 1, wherein monitoring the plurality of downhole parameters comprises measuring an intake temperature.

10. The method as recited in claim 1, wherein monitoring the plurality of downhole parameters comprises measuring a pump intake pressure, a pump discharge pressure and an intake temperature.

11. The method as recited in claim 1, wherein monitoring the plurality of downhole parameters comprises measuring distributed temperature.

12. The method as recited in claim 1, wherein monitoring the plurality of downhole parameters comprises measuring a fluid viscosity.

13. The method as recited in claim 1, wherein monitoring the plurality of downhole parameters comprises measuring a fluid density.

14. The method as recited in claim 1, wherein monitoring the plurality of downhole parameters comprises measuring a bubble point.

15. The method as recited in claim 1, wherein at least one of monitoring a plurality of production parameters and monitoring a plurality of downhole parameters comprises using a multiphase flowmeter.

16. The method as recited in claim 1, wherein evaluating comprises processing the data on a computer.

17. The method as recited in claim 1, wherein adjusting comprises changing a frequency output of a variable speed drive.

18. The method as recited in claim 1, wherein adjusting comprises adjusting a choke to change flow rate.

19. The method as recited in claim 1, wherein adjusting comprises removing a blockage.

20. The method as recited in claim 1, wherein adjusting comprises repairing a leak.

21. A system for optimizing production in a well, comprising:

an electric submersible pumping system positioned in a well;

a sensor system having sensors positioned to sense a plurality of production related parameters; and

a well modeling module able to receive input from the sensors, wherein the well modeling module is able to contrast model values with measured data based on input from the sensors in a manner indicative of specific problem areas detrimental to optimizing production from the well.

22. The system as recited in claim 21, wherein the production related parameters are sensed in real time.

23. The system as recited in claim 21, further comprising a validation module for validating data used in modeling the well.

24. The system has recited in claim 21, wherein the sensor system comprises sensors positioned to take both downhole measurements and surface measurements.

25. The system as recited in claim 23, wherein the validation module is able to validate pressure, volume, and temperature data.

26. The system as recited in claim 23, wherein the validation module is able to validate an above the pump fluid gradient.

27. The system as recited in claim 23, wherein the validation module is able to validate a differential pressure across the pump.

28. The system as recited in claim 23, wherein the validation module is able to validate an outflow versus an inflow of fluid to the pump.

29. The system as recited in claim 21, further comprising correcting a specific problem area determined from contrasting the model values with measured data.

30. The system as recited in claim 29, wherein correcting a specific problem area comprises changing a frequency output of a variable speed drive.

31. The system as recited in claim 29, wherein correcting a specific problem area comprises adjusting a choke to change flow rate.

32. The system as recited in claim 29, wherein correcting a specific problem area comprises removing a blockage.

33. The system as recited in claim 29, wherein correcting a specific problem area comprises repairing a leak.

34. The system as recited in claim 29, wherein correcting a specific problem area comprises removing a blockage from a pump intake.

35. A method of diagnosing the operation of an electric submersible pumping system having a pump powered by a submersible motor, comprising:

gathering production related data;

comparing calculated pressure, volume, and temperature values against measured data;

checking calculated above the pump gradient values against measured data;

matching calculated across the pump values with measured data; and

determining any unwanted discrepancies between calculated values and measured data.

36. The method as recited in claim 35, wherein matching comprises matching a differential pressure across the pump and a measured intake pressure.

37. The method as recited in claim 35, further comprising graphically displaying calculated values versus measured data on an output device.

38. The method as recited in claim 35, further comprising making operational adjustments to the electric submersible pumping system to optimize production from the well.

39. A method of optimizing production when an electric submersible pumping system, having a pump powered by a submersible motor, is used as an artificial lift system to produce a fluid, comprising:

gathering production related data;

checking measured pressure, volume, and temperature (PVT) data against calculated PVT data calculated according to a desired model; and

optimizing production based on discrepancies determined between the measured PVT data and the calculated PVT data.

40. The method as recited in claim 39, wherein optimizing comprises changing flow rate by adjusting a valve.

41. The method as recited in claim 39, wherein optimizing comprises changing flow rate by adjusting a choke.

42. The method as recited in claim 39, wherein optimizing comprises changing flow rate by adjusting the frequency of a variable speed drive.

43. The method as recited in claim 39, wherein optimizing comprises changing flow rate by replacing a production related component.

44. The method as recited in claim 39, wherein optimizing comprises changing flow rate by removing a blockage restricting fluid flow.

45. The method as recited in claim 39, wherein optimizing comprises changing flow rate by repairing a fluid leak.

46. The method as recited in claim 39, wherein checking comprises comparing an above the pump gradient.

47. The method as recited in claim 39, wherein checking comprises comparing an across the pump gradient.

48. The method as recited in claim 39, wherein checking comprises comparing a below the pump gradient.

49. The method as recited in claim 39, wherein checking comprises comparing inflow data to outflow data.